

Soft-Story Residential Buildings: A Statewide Perspective on Collapse Risk

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What is the Seismic Safety Commission?



- Public Policy Advisors
- Independent appointees of Governor & Legislature
- 18 Multi-disciplinary Commissioners appointed by Governor
- 4 Local government representatives
- One Senator, One Assemblyman
- 5 Staffmembers



Common Type of Housing



Open Front, Fewer Walls
"Soft Story"



Collapse Crushing Cars





Loss of Life, Housing, Income





Housing Losses in Recent “Strong” EQ’s

- 1989 Loma Prieta EQ in S.F. Bay Area:
 - 7,700 Vacated Apartment Units
- 1994 Northridge EQ: (3% of LA’s Housing)
 - 16 lives lost in Northridge Meadows Apts
 - 34,000 multi-family units in LA region vacated
 - 17 “Ghostowns”: vacant apt & condo complexes



Loss Estimates For Future "Major" EQ's

- Two thirds of future housing losses expected in multi-unit apartments
- 150,000+ housing units estimated for future metropolitan earthquakes in CA
- 360,000+ people would relocate

Compare Hurricane Katrina:

500,000 housing units damaged or destroyed

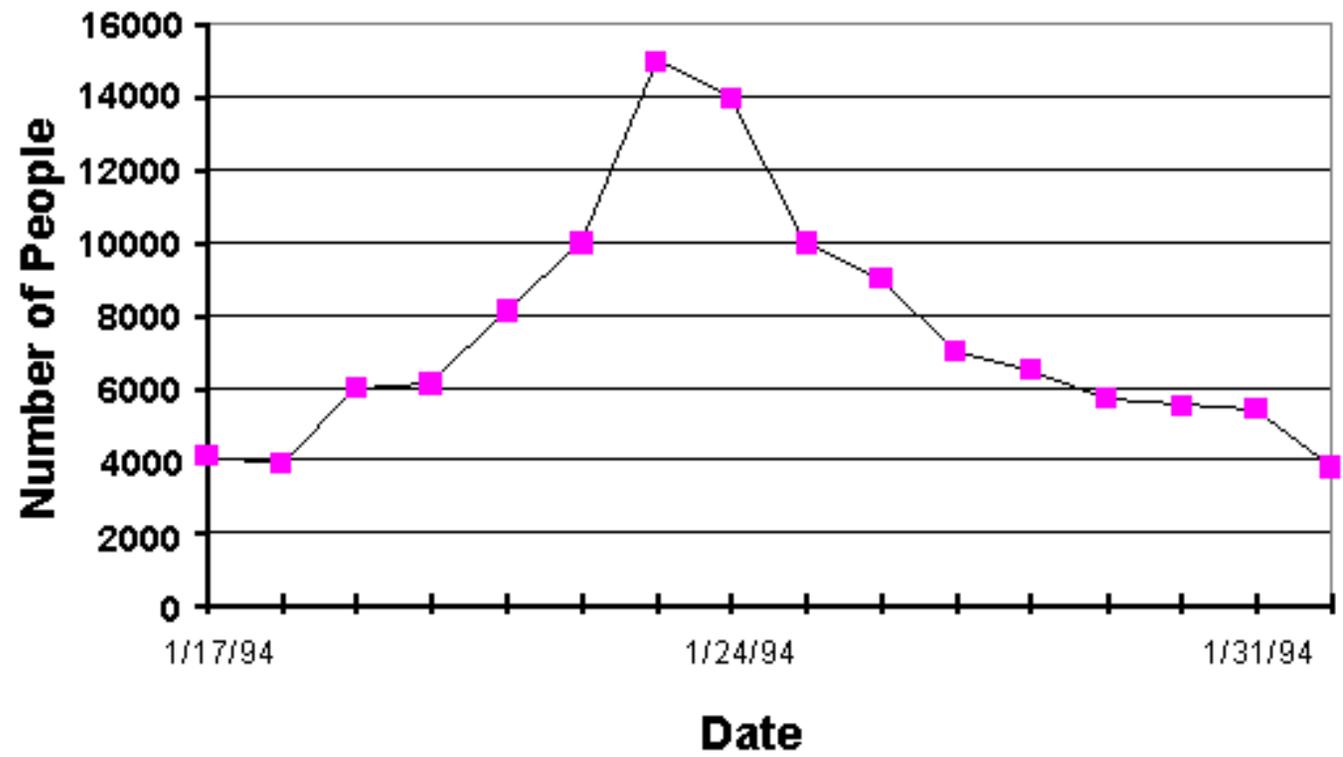


Residents in Emergency Shelters



NORTHRIDGE EARTHQUAKE

Number of People Staying in Shelters



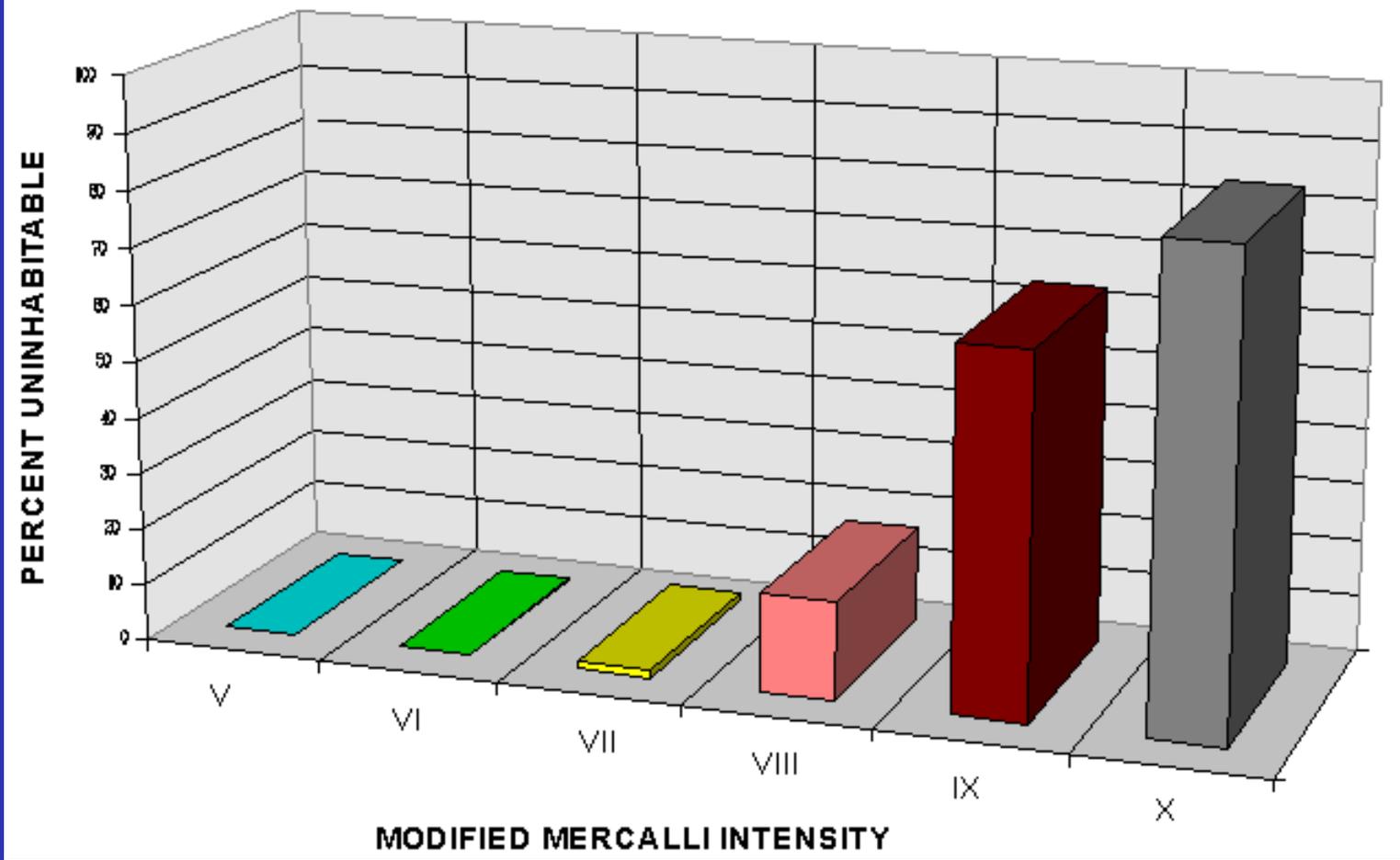
Source: American Red Cross



Uninhabitable vs. Shaking Intensity, Pre-1940



**WOOD 1-3 STORIES PRE-1940 MULTI-FAMILY
PERCENT UNINHABITABLE BY MMI INTENSITY LEVEL**

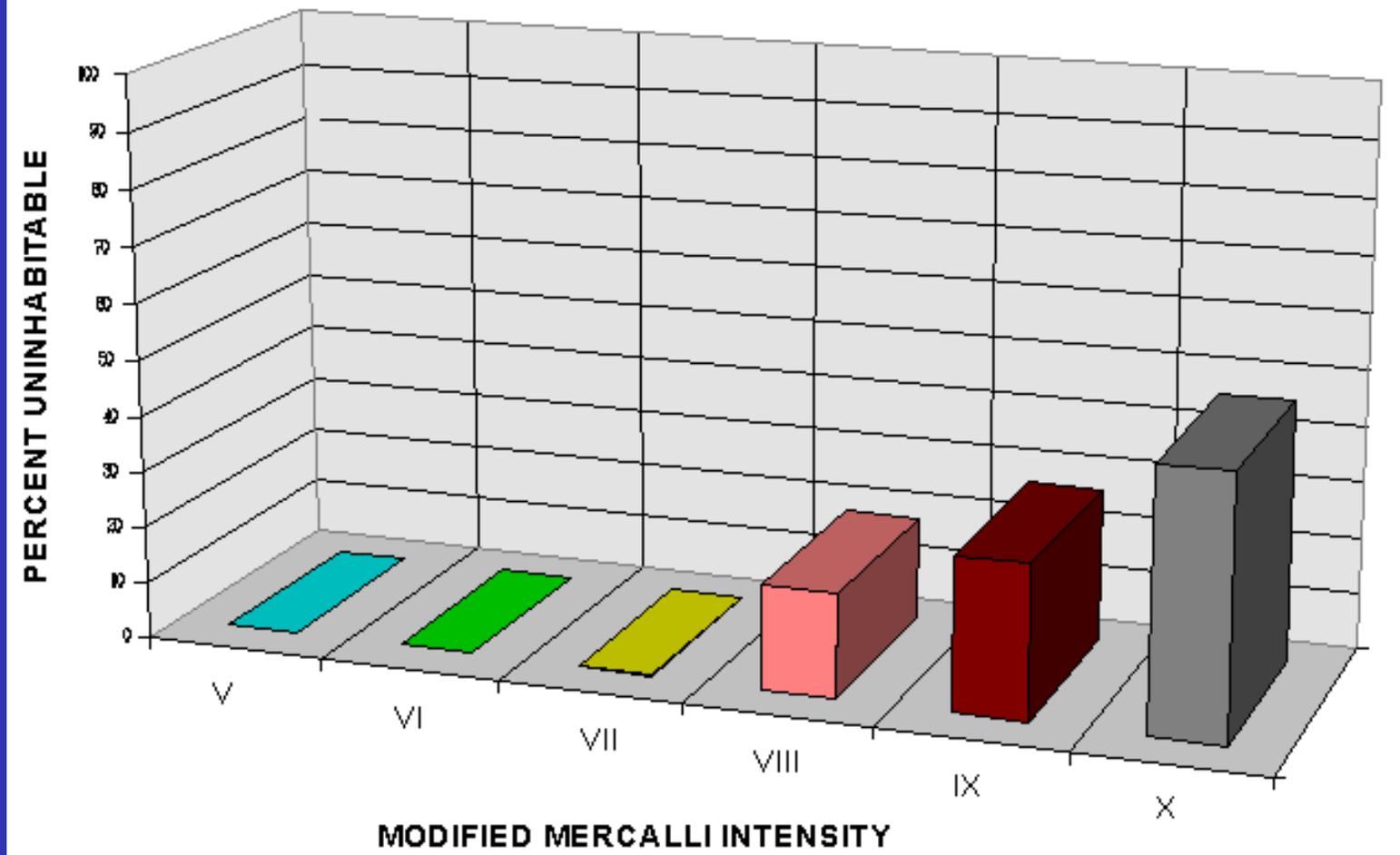




Uninhabitable vs. Shaking Intensity, Built after 1939



**WOOD 1-3 STORIES POST-1939 MULTI-FAMILY
PERCENT UNINHABITABLE BY MMI INTENSITY LEVEL**





1994 Northridge Earthquake Shaking Intensity



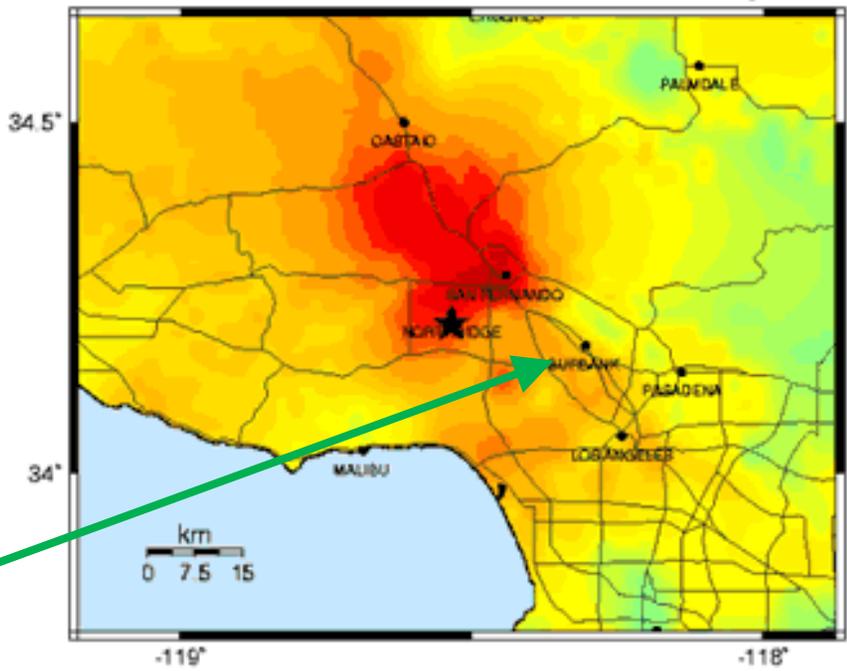
1994 Northridge
quake
M 6.7

Note offset of main
damage to north
of epicenter

***Burbank Dodged
The Bullet***



TriNet Rapid Instrumental Intensity Map for Northridge Earthquake
Mon Jan 17 04:30:55 AM PST M 6.7 N34.21 W118.54 ID:Northridge



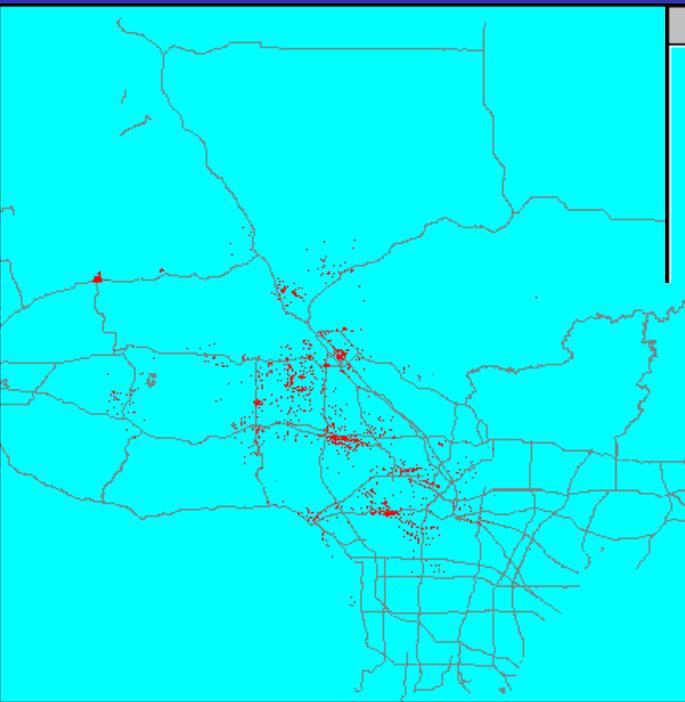
PROCESSED: Tue Jul 26 02:36:07 PM PDT, Produced by ShakeMap V2

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC (%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-66	66-124	>124
PEAK VEL (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-66	66-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

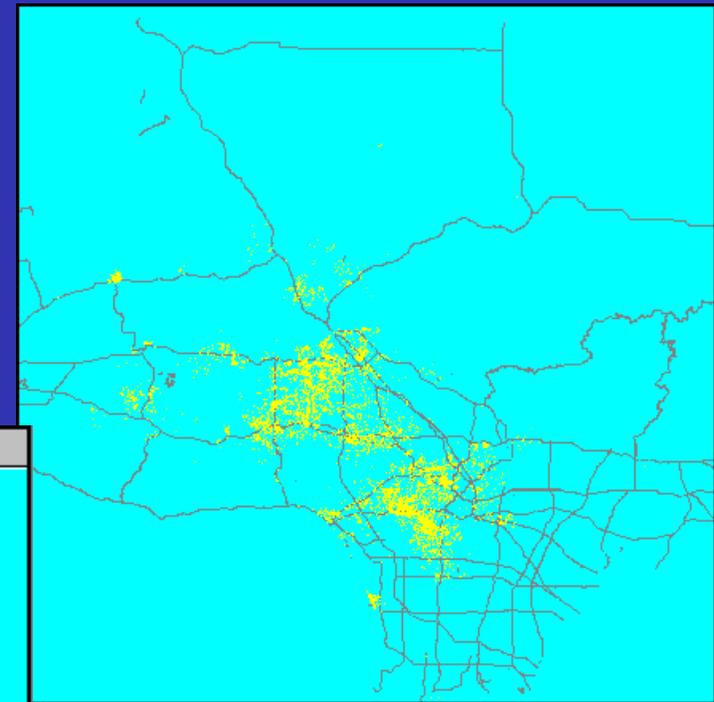


Time to Repair & Replace Damaged Housing

- Northridge Red & Yellow Tag Apt Bldgs:
 - 50 percent back in use in 3 years
 - 98 percent back in use in 5 years



UNINHABITABLE HOMES
Northridge Earthquake
Magnitude 6.7
■ Red-Tagged Homes
and Condos/Apts.
— Highways
Source: ABAG, 1996
"Shaken Awake!"



UNINHABITABLE HOMES
Northridge Earthquake
Magnitude 6.7
■ Yellow-Tagged
Condos/Apts.
— Highways
Source: ABAG, 1996
"Shaken Awake!"



State Law on Soft Story Bldgs

AB 304 (Hancock) enacted in 2005:

– Supported by:

- California Building Officials
- CA Seismic Safety Commission
- Association of Bay Area Governments

– Sponsored by: City of Berkeley

- Health & Safety Code 19160 – 19168

www.leginfo.ca.gov



State Law on Soft Story Bldgs

- Soft Story Buildings constructed before 1978 may:
 - Create dangerous conditions
 - Threaten trapped occupants
 - Ignite fires
 - Threaten neighborhoods
 - Create disproportionate burdens on poor, elderly, young populations

H&S Code 19160 – 19168



State Legislative Intent

- Encourage Cities and Counties to reduce collapse risk in soft story bldgs
 - Identify collapse-risk buildings
 - Adopt retrofit standards, preferably nationally-recognized standards
 - Provides flexibility to local governments
 - Provides a 15-year “halo” for buildings that are retrofitted

H&S Code 19160 – 19168



Local Government Initiatives/Pioneers

- Fremont – Requires Retrofits
- Santa Monica – Required Retrofits, undergoing amendments
- Berkeley – Requires Evaluations, warning placards
- Los Angeles – Voluntary Strengthening
- San Francisco, Santa Clara County, San Jose – undertook inventories

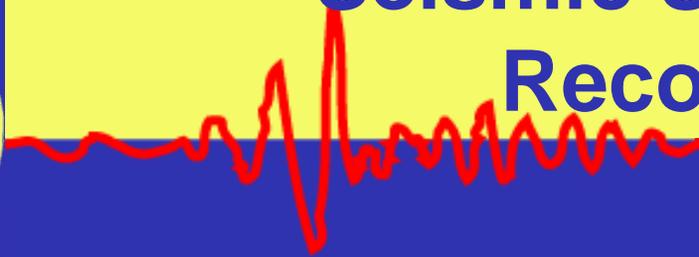


Federal/State Policies and Laws

- Federal Disaster Mitigation Act of 2000
- Requires Mitigation Goals/Priorities
- CA's Multi-Hazard Mitigation Plan:
 - Earthquake Risk Reduction a top priority
 - Lists Multi-Unit Residential Buildings as a priority for reducing collapse risk
 - 130,000 bldgs with 2+ million units
 - 46,000 soft story bldgs 730,000+ units



Seismic Safety Commission Recommendations



- Local Mandatory Retrofit Ordinances
- Adopt Appendix Chapter A4,
International Existing Building Code:
*“Earthquake Hazard Reduction in Existing
Wood-Frame Residential Buildings with Soft,
Weak, or Open-Front Walls”*

Disclosure at Time of Sale



Commercial Property Owner's Guide to Earthquake Safety

2006 Edition



Published by the
California
Seismic Safety
Commission

State of
California

Arnold Schwarzenegger,
Governor

SSC No. 06-02



www.seismic.ca.gov/pubs

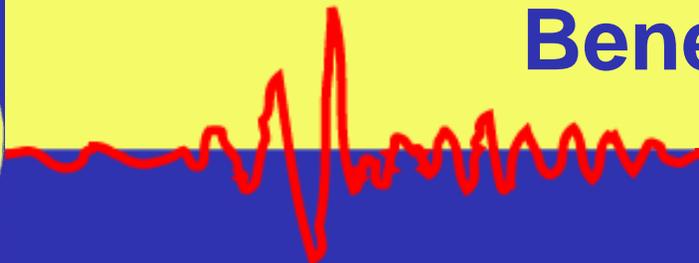


Commercial Property Owner's Guide to Earthquake Safety

- Describes the soft story problem
- How owners and buyers can identify it
- How to fix the problem
 - Hire an architect or engineer
 - Design a retrofit
- Encourages owners to disclose to buyers all soft story conditions when buildings are sold



Benefits to Public



- Fewer earthquake losses – lives, injuries, property, neighborhood integrity
- Less demand for emergency shelters
- Protect/prolong affordable housing
- Quicker recoveries after earthquakes



Benefits to Owners

- Help reduce deaths, injuries and liability after future earthquakes
- Help reduce losses to rental income & investments
- Help extend building life



Questions Welcome

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CA Seismic Safety Commission